

What is claimed is:

1. A projection optical system which projects luminous flux from an image forming element which forms an original image onto a projection surface, and has a reference axis which is defined as a path of a central principal ray which is a principal ray of luminous flux from the center of the original image to the center of an image of the original image projected on the projection surface, the reference axis on an incident side and the reference axis on an emerging side of the projection optical system are oblique to each other, the projection optical system comprising:

a plurality of reflecting surfaces including at least three reflecting surfaces, each of the surfaces having a curvature,

wherein the plurality of reflecting surfaces are arranged such that the reference axis has at least one intersection in the projection optical system.

2. The projection optical system according to claim 1, wherein the reference axis on the incident side forms an angle of 30 degrees or more with the reference axis on the emerging side.

3. The projection optical system according to claim 1, wherein each of the plurality of reflecting surfaces is formed of a mirror.

4. The projection optical system according to claim 1, wherein the following expression is satisfied:

$$L > 7Y$$

where L represents a maximum spacing between two adjacent surfaces along the reference axis of the plurality of reflecting surfaces and Y represents a size of the original image in a plane including the reference axis.

5. The projection optical system according to claim 1, wherein a maximum field angle on the incidence side or a maximum field angle on the emerging side of the projection optical system is equal to or larger than 20 degrees.

6. The projection optical system according to claim 1, wherein luminous flux from the original image forms an intermediate image between a final reflecting surface closest to the projection surface of the plurality of reflecting surfaces and another one of the plurality of reflecting surfaces.

7. The projection optical system according to claim 1, wherein the luminous flux from the original image passes through space between at least two reflecting surfaces of the plurality of reflecting surfaces.

8. The projection optical system according to claim 1,

wherein a normal line to the image forming element is substantially perpendicular to a normal line to the projection surface.

9. The projection optical system according to claim 1, further comprising:

at least one refractive optical element disposed closer to the image forming element than the plurality of reflecting surfaces,

wherein an optical axis of the refractive optical element is substantially perpendicular to a normal line to the projection surface.

10. The projection optical system according to claim 9, wherein the optical axis of the refractive optical element is substantially parallel to a normal line to a plane including the reference axis among the plurality of reflecting surfaces.

11. The projection optical system according to claim 9, wherein the optical axis of the refractive optical element is substantially perpendicular to a normal line to a plane including the reference axis among the plurality of reflecting surfaces.

12. The projection optical system according to claim 1, wherein at least one of the plurality of reflecting surface

is rotationally asymmetric.

13. A projection type image display apparatus comprising:  
an image forming element which forms an original  
image; and  
the projection optical system according to claim 1.

14. An image display system comprising:  
the projection type image display apparatus according  
to claim 13; and  
an image information supply apparatus which supplies  
the projection type image display apparatus with image  
information for displaying the original image on the image  
forming element.